# An integrated GIS based statistical model to compute groundwater vulnerability index for decision maker in agricultural area

## ABSTRACT

The conservation areas in a plain are affected by the groundwater contamination from intense application of the fertilizers. The vulnerability of groundwater can be tested by using the DRASTIC model for the pollutants. The groundwater susceptibility to pollution in the various areas is mapped through DRASTIC model. However, the effects of pollution types and its characteristics are not considered, as this model is used without any modifications. This technique must be standardized for usage in the various aquifers and specific pollution types. The rates of DRASTIC parameters are corrected to obtain the potential for a more accurate analysis of the vulnerability pollution. The relationships between the parameters are identified with respect to the nitrate concentration in the groundwater by calculating the new rates. The methodology was applied to the selected area situated in the south eastern region of Iran at Kerman plain. Twenty-seven different locations were selected to test and analyse the nitrate concentration in the water from underground wells. The pollution in the aquifer was associated and correlated with the DRASTIC index by using the measured nitrate concentrations. The relationship between the index and the measured pollution in the Kerman plain was determined by applying the Wilcoxon rank-sum nonparametric statistical tests and the rates were calculated. It was found specifically in the agricultural areas that the modified DRASTIC model performed more efficiently than the traditional method for nonpoint source pollution, as indicated by the results. After modifications, the regression coefficients revealed that the relationship between the vulnerability index and the nitrate concentration was 77 %, while it was 37 % before the modifications were used. These statistics show that the modified DRASTIC performed far more efficiently than the original version.

**Keyword:** GIS; Remote sensing; Hydrogeology; Kerman plain; Modified DRASTIC; Vulnerability